

Name: _____

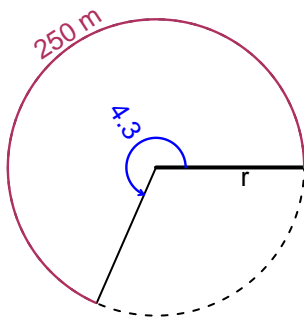
Date: _____

Trig Final (SLTN v654)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.3 radians. The arc length is 250 meters. How long is the radius in meters?

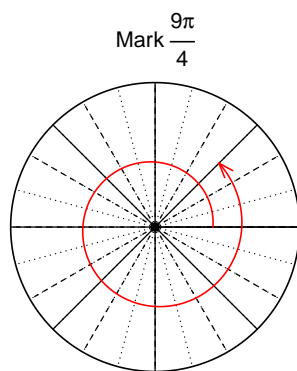


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 58.14$ meters.

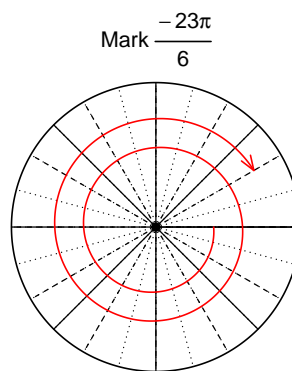
Question 2

Consider angles $\frac{9\pi}{4}$ and $-\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{9\pi}{4}\right)$ and $\cos\left(-\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(9\pi/4)$

$$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$$



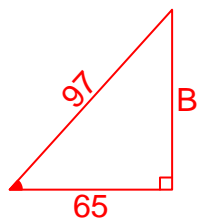
Find $\cos(-23\pi/6)$

$$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$$

Question 3

If $\cos(\theta) = \frac{-65}{97}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

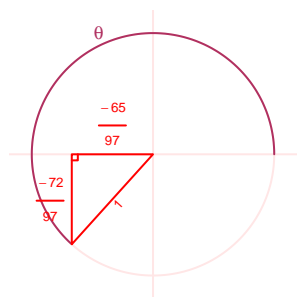
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}65^2 + B^2 &= 97^2 \\ B &= \sqrt{97^2 - 65^2} \\ B &= 72\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{-65}{97}} = \frac{72}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 5.76 Hz, a midline at $y = 2.16$ meters, and an amplitude of 7.53 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -7.53 \sin(2\pi 5.76t) + 2.16$$

or

$$y = -7.53 \sin(11.52\pi t) + 2.16$$

or

$$y = -7.53 \sin(36.19t) + 2.16$$